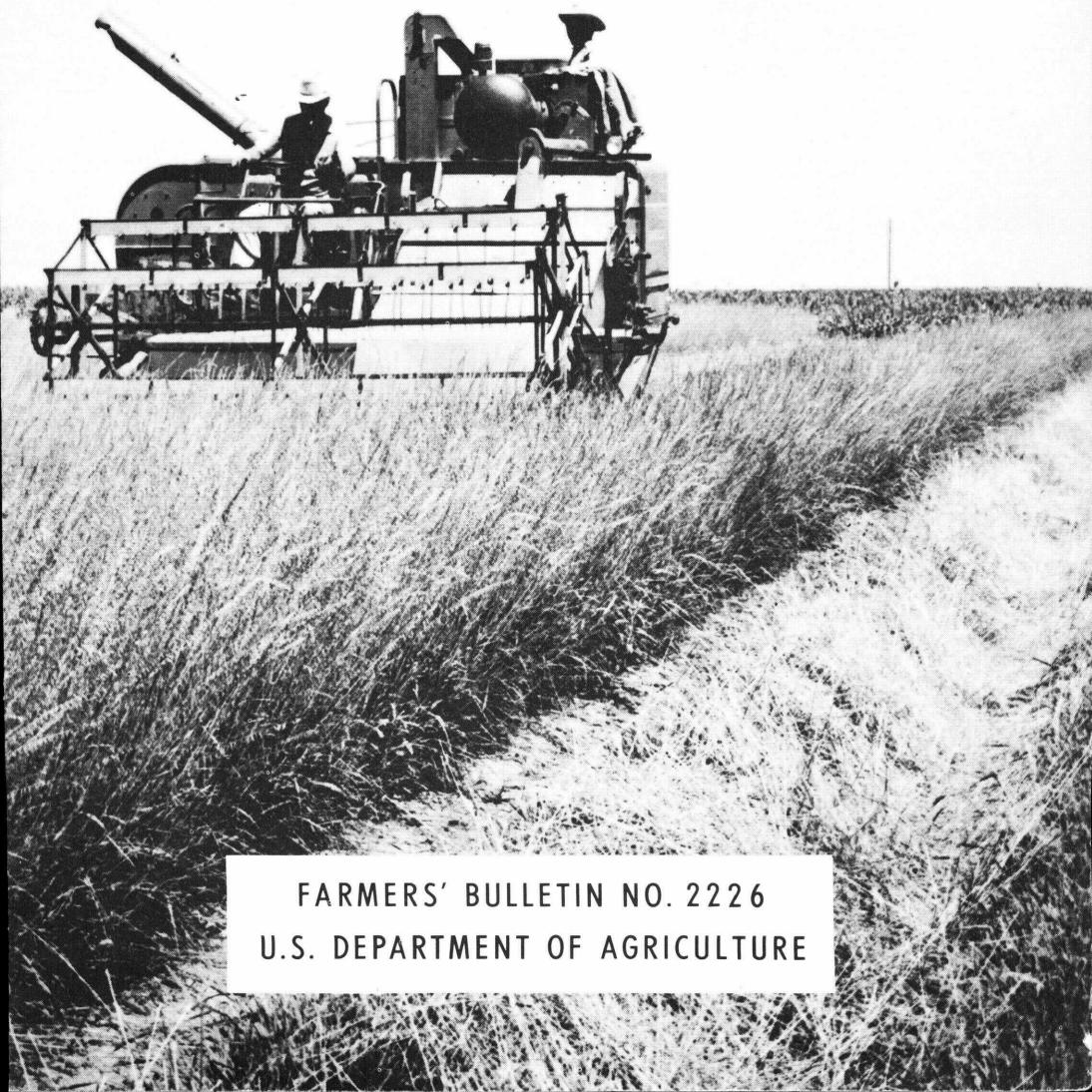
# GRASS SEED PRODUCTION and HARVEST in the GREAT PLAINS





FARMERS' BULLETIN NO. 2226
U.S. DEPARTMENT OF AGRICULTURE

Interest in converting cropland to grass and in improving rangeland by seeding began about 30 years ago when seed of several grasses introduced from Europe and Asia became available. Smooth brome and crested wheatgrass were the two most widely used in seedings. But for some areas, seed of adapted native grasses was needed. Plant specialists scouted native grasslands to find grass plants with superior forage and good seed-production characteristics. Seed companies learned to select ranges that would yield enough seed to make commercial harvest profitable. Farmers, commercial seedsmen, and plant specialists learned to alter conventional equipment and to develop special machines for harvesting seed.

Recently there have been new demands for grass to meet needs in recreation developments and for stabilizing and beautifying exposed banks and earthfills along roads and highways.

This bulletin will help farmers, ranchers, and technicians choose the native and introduced grasses best suited for their specific purpose. It gives characteristics of some of the grasses and the best methods of producing, harvesting, and cleaning the seed.

This publication supersedes Farmers' Bulletin 2112, Producing and Harvesting Grass Seed in the Great Plains.

Washington, D.C. Issued February 1967

## Contents





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# Grass Seed Production and Harvest in the Great Plains

By M. D. ATKINS and JAMES E. SMITH, JR., *plant materials specialists, Soil Conservation Service*

GRASS SEED PRODUCTION can be a profitable part of your farm or ranch enterprise. A growing interest in reseeding the Great Plains, both to improve the rangeland and to convert some cropland to grassland, has increased the demand for grass seed.

Native grassland has been the source of many millions of pounds of seed for the Great Plains. It is still a source of blue grama, buffalograss, western wheatgrass, and green needlegrass. But the primary source of most grass seed is fields planted and managed for seed production.

Skills required to produce high yields of grass seed are much the same as those needed to produce high yields of other farm crops. Seed-production fields must be carefully selected. Adequate water must be available when it is needed. Cultivation, fertilization, and harvesting must be timely and carefully carried out.

## *Grass in Conservation Farming*

Grass is effective in protecting land from wind and water erosion. It can improve the structure of the soil and also raise its water-holding capacity and

KAN-979

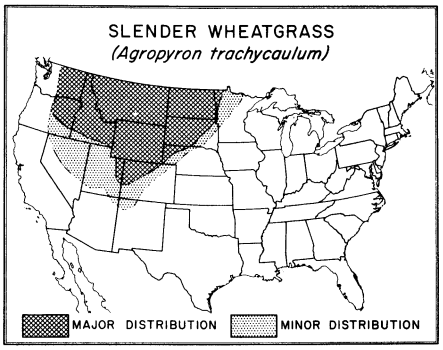
**El Reno sideoats grama grown in rows and intertilled for seed production.**

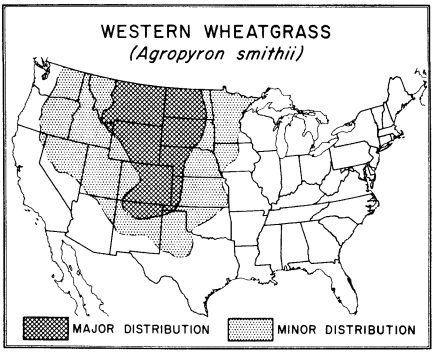
rate of water intake. Grass is used to restore badly eroded land to useful production, to balance the forage needs of livestock, to restore depleted rangeland, to reduce erosion and prevent damage by runoff on steep slopes, and to line waterways and other water-disposal channels.

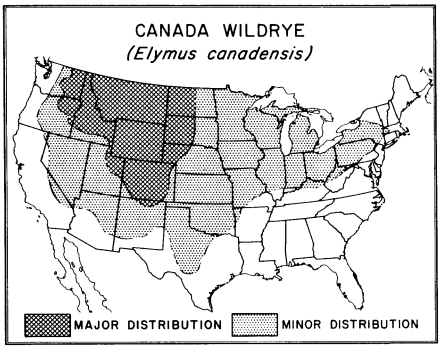
## *Grass Distribution and Adaptation*

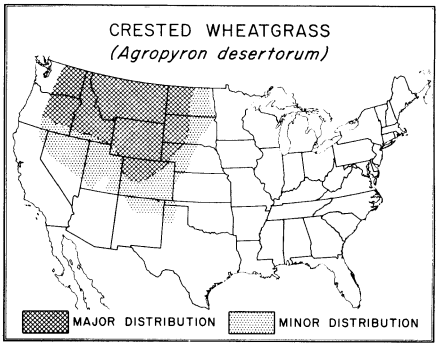
As a group, native grasses and several introduced grasses of the Great Plains are adapted to wide ranges of soil and climate (see center pages).

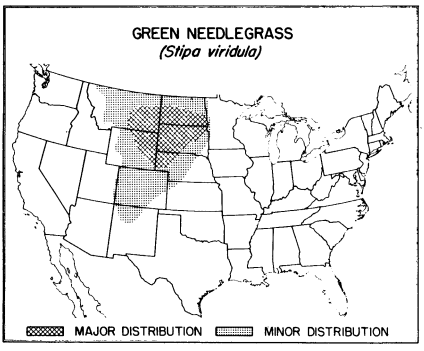
For each of the principal grasses adapted to the Great Plains, general major and minor distribution areas are shown in maps on the following pages. Some of these grasses, however, thrive only on highly fertile soil. Some do well on well drained soil; some require lots of moisture. Some grow well in alkali soil; others have low salt tolerance.

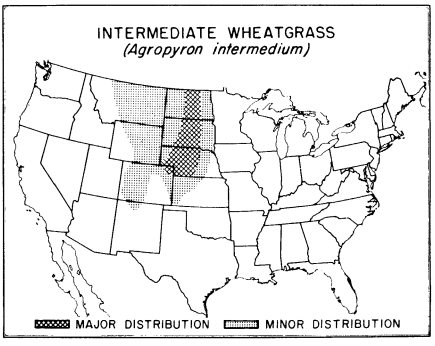


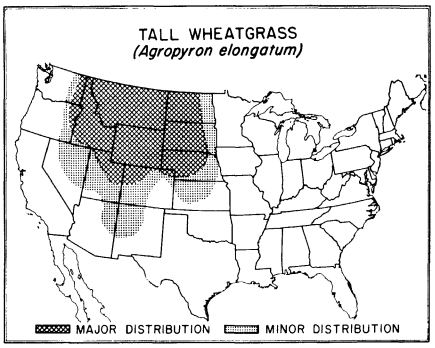



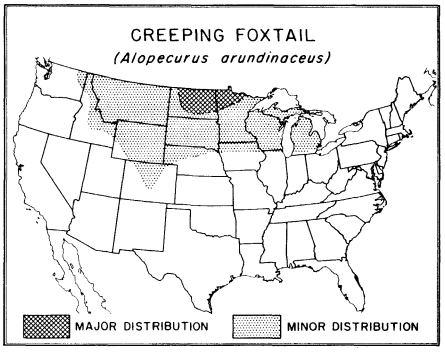




TALL WHEATGRASS
(Agropyron elongatum)
MAJOR DISTRIBUTION
MINOR DISTRIBUTION


CREEPING FOXTAIL
(Alopecurus arundinaceus)
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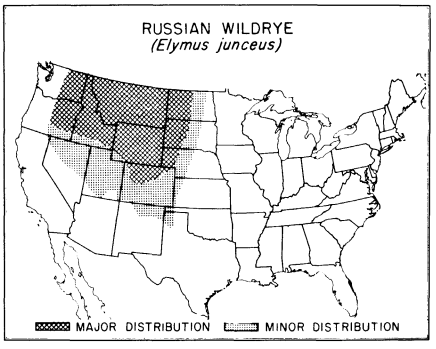
RUSSIAN WILDRYE
(Elymus junceus)
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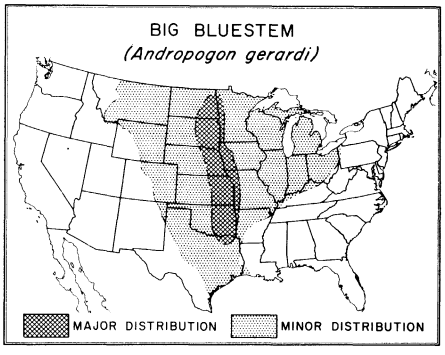
BIG BLUESTEM
(Andropogon gerardi)
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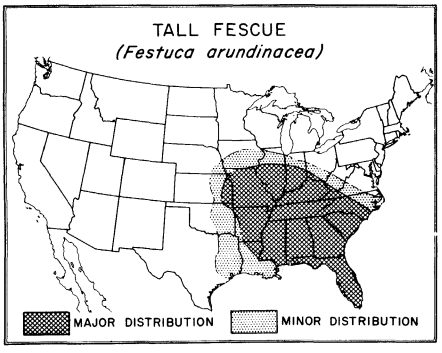
TALL FESCUE
(Festuca arundinacea)
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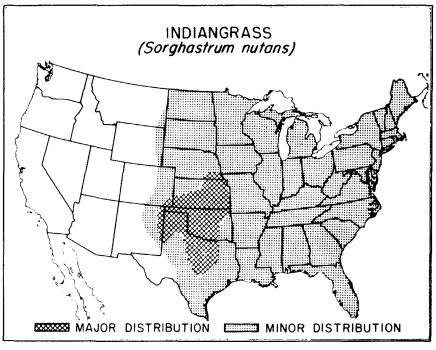
INDIANGRASS
(Sorghastrum nutans)
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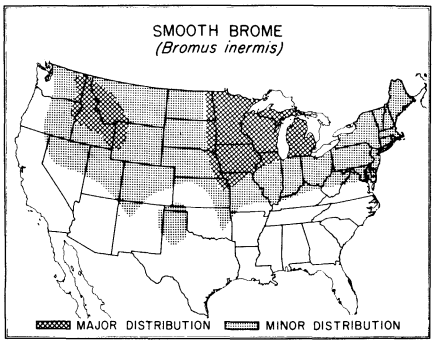
SMOOTH BROME
(Bromus inermis)
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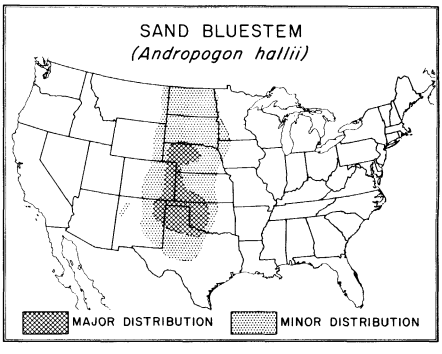
SAND BLUESTEM
(Andropogon hallii)
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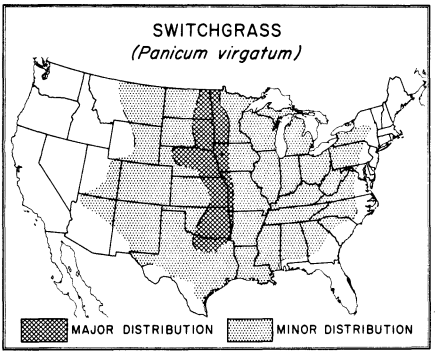
MINOR DISTRIBUTION


SWITCHGRASS
(Panicum virgatum)
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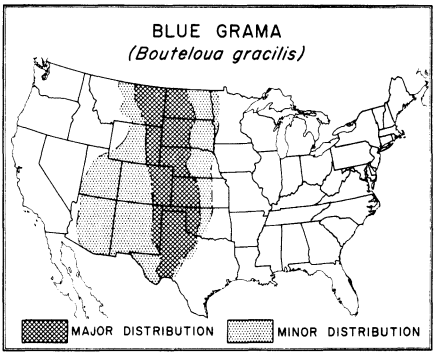
BLUE GRAMA
(Bouteloua gracilis)
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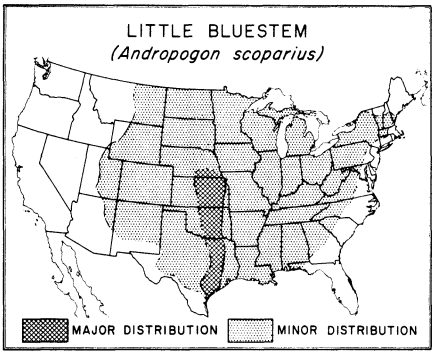
LITTLE BLUESTEM
(Andropogon scoparius)
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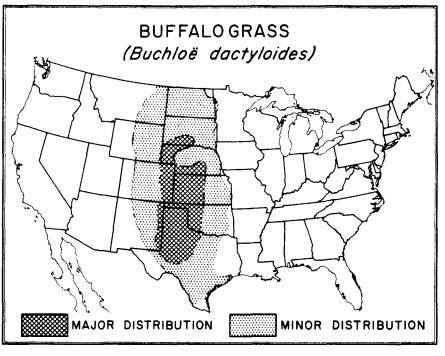
BUFFALOGRASS
(Buchloë dactyloides)
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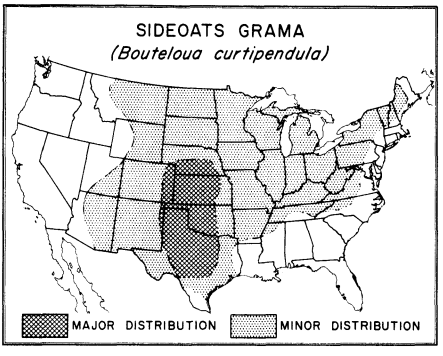
SIDEOATS GRAMA
(Bouteloua curtipendula)
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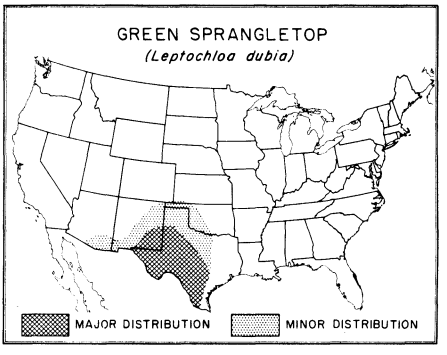
GREEN SPRANGLETOP
(Leptochloa dubia)
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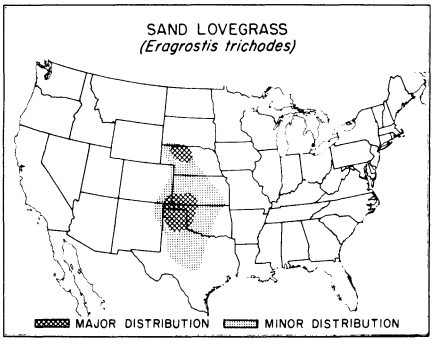
SAND LOVEGRASS
(Eragrostis trichodes)
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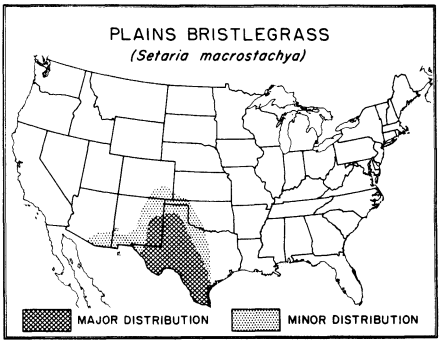
PLAINS BRISTLEGRASS
(Setaria macrostachya)
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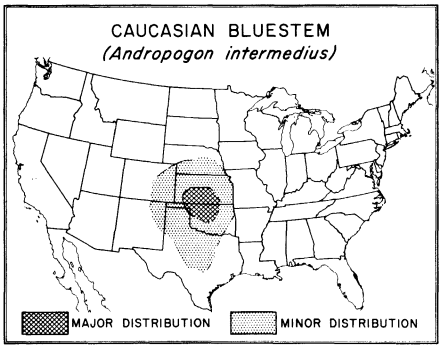
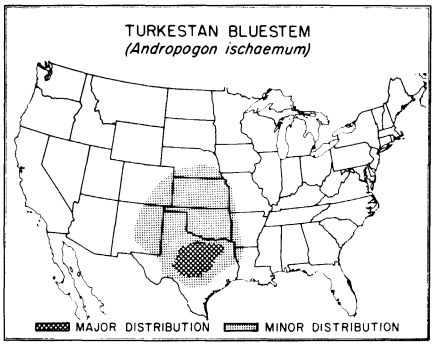
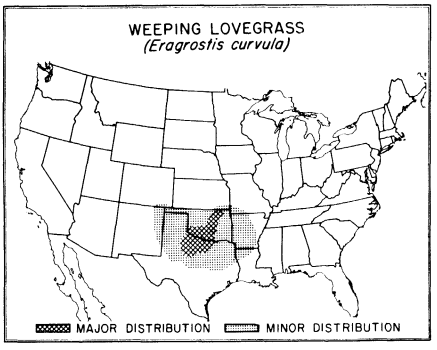
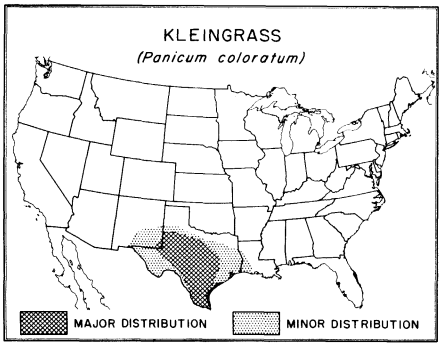


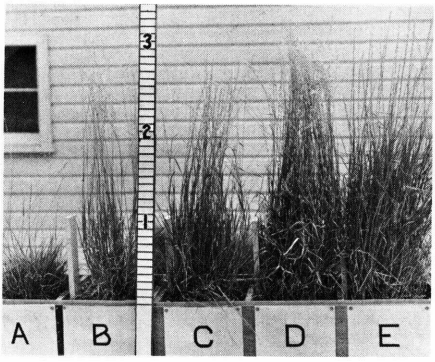

There are wide differences within species. Species and strains of grasses that have developed under the climate of the northern Great Plains are usually unsuited to the southern Plains. And some of those suited to the southern Plains either fail to survive or do poorly in the northern Plains. For this reason, it is important that you know the origin or adaptation of the seed you use. Grass breeding and selection have resulted in varieties adapted to specific sections of the Great Plains. When seeding grass, choose seed of a variety of known local adaptation. If none is available, you may be able to get seed harvested from natural grassland in your area. In general, when seeding native grasses, choose seed originating not more than 150 to 200 miles north or 250 to 300 miles south of where it is to be used. Ask the State agricultural experiment station, the Soil Conservation Service, or agricultural specialists for information on the various grass species and varieties that are best for your specific field conditions. This information will help you in choosing adapted seed that will meet your planting objectives.

## *Producing Grass Seed*

Some farmers in the Great Plains make grass-seed production their primary enterprise. Many others produce seed of one or two grasses. Often seed production fits well into crop rotation in distributing labor and in effective seasonal use of irrigation water.

For most of the Great Plains, it is too dry to get consistently good seed yields without irrigation. To expect a good seed crop 5 years in 10, you need 30 inches of annual rainfall in the southern Great Plains and 18 inches in the northern. With less precipitation, the hazards of grass-seed production without irrigation increase sharply. Don't attempt dryland seed production unless you are prepared to make profitable use of the forage for hay or pasture

in years when little or no seed is produced. With irrigation you can consistently produce good grass-seed yields. Under good management, grass stands will produce for 6 to 10 years or longer, depending on the growth habits of the individual grass under cultivation. Skills needed to produce and harvest grass seed are about the same as those needed to get top yields of other farm crops.




KAN-888

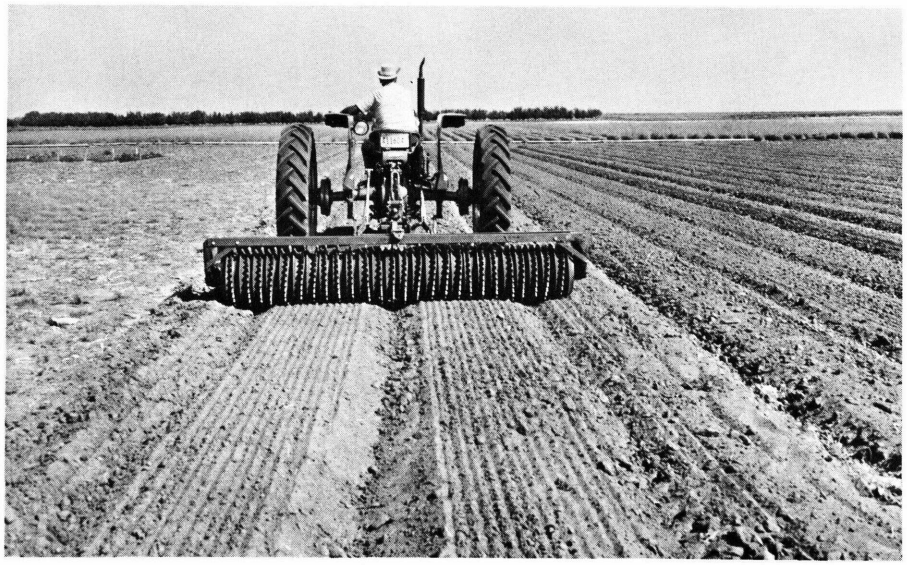
**Sideoats grama collections, grown at Manhattan, Kans., from the following locations in the Great Plains: *A,* Mandan, N. Dak.; *B,* Lincoln, Nebr.; *C,* McPherson, Kans.; *D,* Chickasha, Okla.; and *E,* San Antonio, Tex.**

## Preparing the Seedbed

Select a field that has deep, moderately permeable soil and is free of noxious or other perennial weeds. It should have a smooth surface and uniform grade so that water flowing down the furrows will not spill over onto the planted beds. When this happens, crusting occurs and extra irrigation is required to get seedling emergence.

For planting warm-season grasses, it is best to lay off the beds in the fall. You can delay this until spring if you have a cultipacker to firm the beds. When weed seedlings begin to show in the spring, drag the beds down until furrows are no deeper than needed for the planned flow of water and length of run. Dragging destroys the weeds and firms the soil in preparation for the spring planting of warm-season grasses.

Land irrigated by sprinklers is often sandy and may be subject to soil blowing while a clean seedbed is being



TEX-51, 055

**Firming the soil surface on bedded land before planting grass to be furrow irrigated.**

TEX-51, 057

**A drag being used at the Plant Materials Center, Knox City, Tex., to destroy weeds and firm the soil for spring planting of warm-season grasses.**

prepared. A suitable alternative is to grow a drilled sorghum crop the year before seeding the grass. Harvest, mow, or shred the sorghum to prevent seed maturity. Leave stubble 4 to 5 inches high at the start of winter and plant the grass in early spring without spring tillage or disturbance of the stubble. The short stubble protects young grass seedlings and more than compensates for the slight nuisance it presents to early cultivation of the grass stand.

In the northern Great Plains undisturbed small-grain stubble has been successfully used as cover for fall seedings of cool-season grasses. The field should be nearly free of weeds and volunteer grain. The stubble of spring-sown barley or oats is much better than that of winter wheat.

## Planting Date and Rate

Warm-season grasses are usually planted in the early spring and cool-season grasses in the fall or very early spring—as early in the spring as field work can be started. In the extreme southern part of the Plains where winters are mild, warm-season grasses may be planted in either early fall or spring. Check with your local soil conservation district, Soil Conservation Service specialist, or county agent for the best planting dates in your area.

It is false economy to skimp on the planting rate of grasses grown under irrigation for seed production (table 1). Thin stands allow weeds to persist in the rows. Weed control is expensive. The seedling stand should be so thick and uniform that the grass completely fills the row by the start of the second growing season.

Plant no less than 30 pure live seed units in each foot of row. In arriving at the pounds of seed material needed to furnish this rate, it is usually best to ignore the percentage of total germination shown on the seed tag as "firm" or "hard" seed. For example, if the tag shows germination 61 percent and firm seed 12 percent, ignore the 12 percent firm-seed figure, and calculate the pure live seed (PLS) value by multiplying the germination figure by the purity

*Table 1.—Seed quality standards*

| Grass | Combine-run seed purity [1] | Clean seed | | | Seeds per pound of pure seed [3] |
|---|---|---|---|---|---|
| | | Purity | Germination [2] | Pure live seed | |
| Cool-season grasses: | Percent | Percent | Percent | Percent | Number |
| Canada wildrye | 65 | 85 | 70 | 59.5 | 106,000 |
| green needlegrass | 70 | 90 | 25 | 22.5 | 181,000 |
| slender wheatgrass | 70 | 95 | 90 | 85.5 | 159,000 |
| western wheatgrass | 55 | 80 | 75 | 60.0 | 126,000 |
| crested wheatgrass | 65 | 95 | 90 | 85.5 | 204,000 |
| intermediate wheatgrass | 70 | 95 | 90 | 85.5 | 93,000 |
| tall wheatgrass | 70 | 95 | 90 | 85.5 | 79,000 |
| Russian wildrye | 65 | 95 | 90 | 85.5 | 175,000 |
| tall fescue | 70 | 95 | 90 | 85.5 | 227,000 |
| smooth brome | 70 | 90 | 83 | 74.7 | 145,000 |
| creeping foxtail | 60 | 75 | 80 | 60.0 | 613,000 |
| Warm-season grasses: | | | | | |
| big bluestem | 40 | 60 | 60 | 36.0 | 130,000 |
| indiangrass | 50 | 70 | 60 | 42.0 | 170,000 |
| sand bluestem | 40 | 50 | 60 | 30.0 | 113,000 |
| switchgrass | 70 | 95 | 70 | 66.5 | 389,000 |
| little bluestem | 40 | 50 | 60 | 30.0 | 255,000 |
| sideoats grama | 40 | 60 | 70 | 42.0 | 191,000 |
| sand lovegrass | 70 | 95 | 80 | 76.0 | 1,300,000 |
| blue grama | 30 | 43 | 70 | 30.1 | 711,000 |
| buffalograss | 75 | 90 | [4] 65 | 58.5 | 42,000 |
| green sprangletop | 75 | 90 | 80 | 72.0 | 538,000 |
| plains bristlegrass | 75 | 85 | 60 | 51.0 | 293,000 |
| Caucasian bluestem | 35 | 50 | 60 | 30.0 | 860,000 |
| Turkestan bluestem | 35 | 50 | 60 | 30.0 | 830,000 |
| weeping lovegrass | 75 | 95 | 80 | 76.0 | 1,500,000 |
| kleingrass | 75 | 95 | 70 | 66.5 | 497,000 |

[1] Some seed is marketed by the grower as combine-run seed.

[2] Germination percentage is based on standard seed laboratory tests. For some grasses this breaks seed dormancy; for others it does not.

[3] Figures are representative of seed commonly available on the commercial market.

[4] If seed has been treated to break dormancy.

figure shown on the seed tag for that lot of seed. There are exceptions to this rule. For example, seed tests of green needlegrass and other cool-season grasses may show a high percentage of firm seed. If planted in the fall, part or all of the seed dormancy is overcome during the winter and the seed will germinate well in the spring. In this case, add the firm seed percentage in determining pure live seed.

Multiply the pure live seed (PLS) value by the number of seeds in a pound of pure seed (table 1, column 5) to get the number of pure live seed units you can expect from a pound of this seed. With a row spacing of 40 inches, about 13,000 linear feet of row will make an acre. This means you must plant 390,000 (13,000 x 30) pure live seed units per acre.

The following is an example of how to make this calculation for sideoats grama seed that has a 68-percent germination (excluding firm seed) and a 60-percent purity:

1. .68 (germination) X .60 (purity) = .408 or 40.8 percent PLS;

2. 191,000 seeds per pound of pure seed (from table 1, column 5) X 40.8 percent PLS = 77,928 PLS units per pound of this sideoats grama;

3. 390,000 PLS (units needed per acre) ÷ 77,928 PLS (units per pound

of sideoats grama) = 5 pounds bulk seed needed.

## Row Spacing

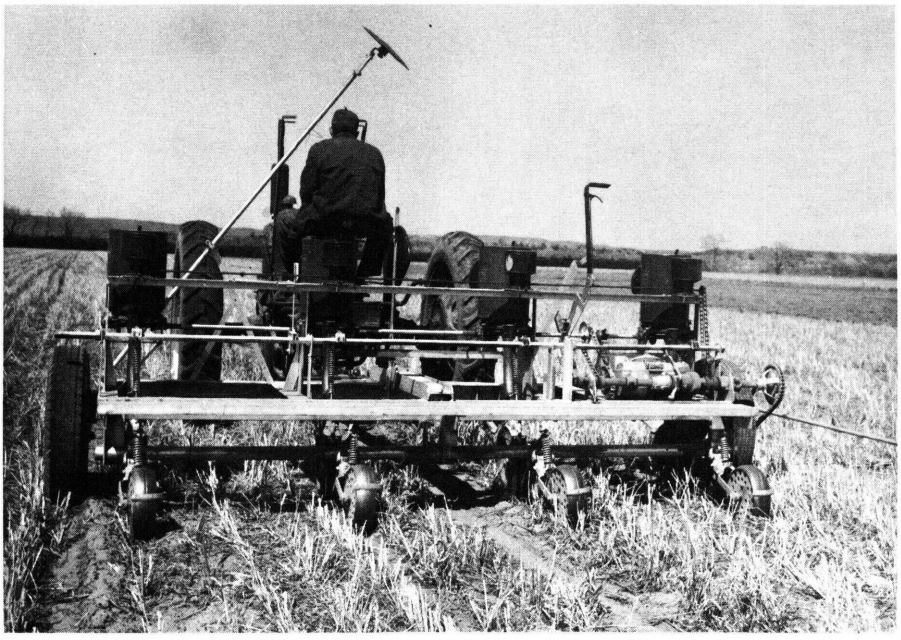
Optimum row spacing for most grasses planted for seed production is 40 inches. It is best to use the same row spacing for grass that you use for other row crops so that cultivating equipment on hand can be used without change. Special purpose cultivators are available but usually are not needed to do a good job of growing grass.

Some grasses, such as western wheatgrass, spread rapidly from the row by rootstalks. Maintain such grasses in a row pattern for as long as feasible. When it becomes difficult to keep the row middles open with cultivation, continue to ditch the middles to aid irrigation. As seed yields begin to drop, plow the field and reestablish the grass.

Buffalograss is an exception to this general rule. It should be seeded, or sodded, on flat land—not bedded—so that the seed can be machine harvested. Allow the stolons to cover the row middles as soon as they will; then manage so as to maintain a dense mat of grass.

## Planting Machinery

There is no standard planting machinery capable of metering out a wide variety of grass seed and properly placing it in the ground. Common grain drills plant seed of most of the wheatgrasses with good success, but they will not plant either chaffy or slick seed. Vegetable planters will meter out small free-flowing seed but cannot handle chaffy seed. Neither the grain drill nor the vegetable planter is equipped to place the seed properly and control planting depth.



KAN-1764

**Planting sand bluestem with a special four-row planter in sorghum stubble seedbed. Cotton boxes are used to plant chaffy seed like bluestems, gramas, and indiangrass. Small boxes mounted behind the cotton boxes plant small free-flowing seed such as lovegrass, switchgrass, and kleingrass. Disk-furrow openers have depth-control bands and heavy packer wheels follow the openers.**

Equipment that does a good job of planting all kinds of grass seed includes:

Combination corn and cotton hoppers for rough or chaffy seed and Planet Jr.-type hoppers for clean free-flowing seed. Mount the seed hoppers so the seed tubes from both hoppers lead directly to the furrow openers. Cotton bottoms with a picker wheel are better for chaffy seed than those with plates.

Double-disk furrow openers with depth regulating bands attached to the disks to prevent placing seed deeper than three-fourths of an inch—a depth satisfactory for all grass seed from the largest to the smallest.

Smooth, flat or slightly convex press wheels that follow immediately behind the opening disks with enough weight to close and firm the narrow furrows.

Special grass drills that have all these features are available. When equipped with a row marker, the drill can be used for row planting on smooth ground by putting seed only in the seed-box compartments that correspond to the desired row spacing.

Some equipment companies offer a row-planter attachment designed for mounting on a standard tool bar cultivator frame; the planter shaft is driven by a chain from the tractor axle. This attachment can easily be modified and used as a grass planter. Simply construct a frame to carry the press wheel and the double-disk furrow opener and bolt to the cultivator frame. Then mount a twin-row Planet Jr.-type box. The result is a sturdy row planter that does an efficient job of planting on any type of seedbed.

## Irrigating

Since emergence and establishment of grass seedlings depend on rain or on irrigation water applied after planting, there is no real value in preplanting ir-

TEX-51, 056

**A special two-row planter for farm tractors with a three-point hitch. This planter has all of the features needed for precise planting of grass seed in spaced rows.**

TEX-51, 059

**This special grass drill can be adapted for row planting by using only part of the seedbox compartments.**

rigation. On established grass fields, water applied by gravity flow in furrows is the most effective way to irrigate for seed production. Sprinkler irrigation can be used for some grasses but is less efficient, entails higher equipment investment, and requires more labor to apply the water.

Different grasses have different water requirements; here are some general guides:

- Design the irrigation system and prepare the seedbed to permit even distribution and efficient application of irrigation water.
- Plan to irrigate for stand establishment. Keep the soil surface moist after planting by irrigating as necessary until the grass seedlings emerge; then apply water only often enough to maintain a steady rate of growth.
- Once you start irrigating established stands, repeat often enough for uninterrupted plant growth. Frequency of irrigation and water needs vary with the kind of grass you are growing, with the kind of soil, and with seasonal temperature, rainfall, and wind.
- Learn to know the feel and appearance of the soil when moisture is at field capacity. Check after each irrigation to be sure soil moisture is at field capacity to a depth of about 3 feet.
- You may be able to fit grass-seed production into your farm cropping system even when the supply of irrigation water is limited. Water requirements for producing a grass seed crop are less than for most field crops. Most grasses yield a good seed crop with less than 20 inches of irrigation water. If water is needed for other crops in spring and early summer but will be available in late summer and fall, grow grasses like kleingrass, green sprangletop, switchgrass, and big bluestem. They produce a seed crop in the fall from late-summer irrigations. If water is available in the fall and not during the summer, use it to grow cool-season grasses such as western wheatgrass and green needlegrass.

NEB-1826

**Using a tractor-mounted cultivator to maintain grass in rows for seed production.**

• Apply water when heading starts, or 5 to 6 weeks before expected seed maturity, to bring soil moisture to field capacity at the 3-foot depth.

• Grass plants must have ample water during flowering. Be sure the soil moisture is at field capacity within a week after flowering begins. Apply no water after this.

Several of the warm-season grasses used in range and pasture plantings in the Great Plains set some seed throughout the growing season if soil moisture is available. This is true of sideoats grama, Caucasian and Turkestan bluestem, blue panic, green sprangletop, kleingrass, and plains bristlegrass. In growing seed of these grasses, fertilize and irrigate so that most seed heads are formed by early summer. Then stop irrigating. About August 15 fertilize and start irrigating again to produce a fall seed crop for harvest in late September or early October. Don't attempt to produce a seed crop during the hot summer months.

Cool-season grasses respond to a different schedule. Apply 50 to 80 pounds of nitrogen in September or October and irrigate to field capacity. Be prepared to irrigate again in the spring as necessary to bring soil moisture to field capacity just before heading. Irrigation timing is a critical factor in grass-seed production.

## Cultivation and Management

For high sustained seed yields most grasses must be maintained in rows by cultivation. A sturdy tractor-mounted row-crop cultivator usually will do this job. Cultivate new plantings as soon as you can see the rows of grass seedlings. The first cultivation, properly carried out, is slow and tedious but most important for rapid stand development. The kind and arrangement of shovels, disks, or sweeps depend on the kind of grass, age of stand, and weeds to be controlled.

Experimental use of a rototiller for cultivating established grass stands shows it is effective in keeping grass in

rows and incorporating crop aftermath into the soil. But more information is needed on how it affects yields. The cost of the machine and its power requirement limit its acceptance.

If your land has been relatively free of weeds for many years, you may have no weed problem in grass seed fields. The tall growing rhizomatous grasses compete well with weeds and reduce the problem. Usually you will have to use herbicides for weed control within the row. New herbicides are coming so rapidly that specific recommendations for their use are inadvisable. 2,4-D is effective in controlling broadleaf annual weeds while they are small. Preemergents such as simazine, atrazine, and diuron give good control of annual grasses in established stands of perennial warm-season grass. Apply them before grass starts growth in the spring. Crop aftermath must be removed so that the herbicide is applied on and penetrates into the soil. Get local recommendations on specific herbicides and the rate to use.

**Caution: If you use herbicides, apply them only when needed and handle them with care. Follow the directions and heed all precautions on the container label. If herbicides are not handled or applied properly, or if unused portions are disposed of improperly, they may be injurious to humans, domestic and wild animals, desirable plants, honey bees and other pollinating insects, and fish, and they may contaminate water supplies.**

If you have noxious weeds such as field bindweed, Canada thistle, quackgrass, and johnsongrass, you must eliminate them from seed fields. Get the most recent information on control measures from agricultural experiment station specialists or the SCS specialist. Often spot treatment with special herbicides is effective but you may have to eliminate the noxious weeds with hand labor.

MONT-10, 162

**A rototiller cultivating an established stand of grass.**

# plant characteristics

| | Growth habit | | | | Site adaptation | |
|---|---|---|---|---|---|---|
| | Bunch | Sod | Fibrous roots | Rhizomes or stolons | Low-land | Up-land |
| **COOL-SEASON GRASSES** | | | | | | |
| Canada wildrye | ● | | ● | | | ● |
| green needlegrass | ● | | ● | | | ● |
| slender wheatgrass | ● | | ● | | | ● |
| western wheatgrass | | ● | | ● | ● | ● |
| crested wheatgrass | ● | | ● | | | ● |
| intermediate wheatgrass | | ● | | ● | | ● |
| tall wheatgrass | ● | | ● | | | ● |
| Russian wildrye | ● | | ● | | | ● |
| smooth brome | | ● | | ● | | ● |
| tall fescue | ● | | ● | | ● | ● |
| creeping foxtail | | ● | | ● | ● | |
| **WARM-SEASON GRASSES** | | | | | | |
| big bluestem | | ● | | ● | ● | ● |
| indiangrass | | ● | | ● | ● | ● |
| sand bluestem | | ● | | ● | | ● |
| switchgrass | | ● | | ● | ● | ● |
| little bluestem | ● | | ● | | | ● |
| sideoats grama | | ● | | ● | | ● |
| sand lovegrass | ● | | ● | | | ● |
| blue grama | ● | | ● | | | ● |
| buffalograss | | ● | | ● | | ● |
| green sprangletop | ● | | ● | | | ● |
| plains bristlegrass | ● | | ● | | | ● |
| Caucasian bluestem | ● | | ● | | | ● |
| Turkestan bluestem | ● | | ● | | | ● |
| weeping lovegrass | ● | | ● | | | ● |
| kleingrass | ● | | ● | | | ● |

[1] Early summer, June 1–July 15; late summer, July 16–August 30; fall, September 1–Octob
Species harvested in early summer sometimes produce a second crop.

| Soil adaptation | | Rate of spread | | | | Season of seed maturity [1] | | | Height at seed maturity |
|---|---|---|---|---|---|---|---|---|---|
| | | Seed | | Rhizomes or stolons | | | | | |
| Sand | Silt or clay | Fast | Slow | Fast | Slow | Early summer | Late summer | Fall | |
| | | | | | | | | | Feet |
| ● | ● | ● | | | | | ● | | 3–4 |
| | ● | | ● | | | ● | | | 3–4 |
| | ● | ● | | | | ● | | | 3–4 |
| | ● | | | ● | | | ● | | 2–3 |
| | ● | | ● | | | | ● | | 2–3 |
| | ● | | | ● | | | ● | | 4–5 |
| | ● | | ● | | | | ● | | 4–5 |
| | ● | | ● | | | | ● | | 3–4 |
| | ● | | | ● | | | ● | | 3–4 |
| | ● | | ● | | | | ● | | 3–4 |
| | ● | | | | ● | ● | | | 3–4 |
| | ● | | | | ● | | | ● | 5–6 |
| ● | ● | | | ● | | | | ● | 5–6 |
| ● | | | | ● | | | | ● | 5–6 |
| ● | ● | | | ● | | | | ● | 4–5 |
| ● | ● | ● | | | | | | ● | 3–4 |
| ● | ● | | | | ● | | ● | | 2–3 |
| ● | | ● | | | | | | ● | 3–4 |
| | ● | | ● | | | | | ● | 1–2 |
| | ● | | | ● | | | ● | | ½–1 |
| ● | ● | ● | | | | ● | | | 3–4 |
| ● | ● | | ● | | | ● | | | 1–2 |
| | ● | ● | | | | ● | | | 3–4 |
| | ● | ● | | | | ● | | | 3–4 |
| ● | | | ● | | | ● | | | 3–4 |
| | ● | | ● | | | ● | | | 3–4 |

er 30.

## Fertilizing

Don't apply fertilizer at the time you plant your grass seed unless you have equipment that places the fertilizer in a narrow band beneath the seed. Any other placement stimulates weed growth and is of little or no benefit to the small grass seedlings. For the same reason, do not fertilize during the seedling year.

Once they are established, grass seed fields must be fertilized for maximum seed yield. Soil tests from your fields should be your guide for the kind and amount of fertilizer to use. It is good practice to fertilize also at higher and lower rates than the test indicates. From the results you can determine the rate that will give you the greatest return.

Applications of nitrogen nearly always increase seed yield. For most grasses, 40 to 80 pounds per acre is the optimum rate. Tall sod-forming grasses need a higher rate than low-growing bunch grasses. In the Great Plains, applications of phosphate usually have not given significant increases in seed yields.

Cool-season grasses respond to fall or very early spring applications of fertilizer. Some warm-season grasses respond to an application soon after growth starts in the spring. For others, delay fertilization until you start irrigating in mid or late summer. Grasses that produce more than one seed crop during a growing season need split applications.

## Controlling Insects and Diseases

Thrip is the most common insect pest that is damaging to seed production. But the red spider mite, wheathead army worm, cornstalk borer, midge, frit fly, and wasps are reported to have caused damage to some grasses and to have reduced seed yields. Dieldrin controls thrips effectively when applied as the seed heads begin to emerge from the boot. One or two follow-up treatments at 2-week intervals are necessary. Dieldrin also controls the frit fly.

**Caution: Pesticides are poisonous to man and animals. Handle them with care. Follow all directions and heed all precautions on container labels. To protect water resources, fish, and wildlife, be careful not to contaminate streams, lakes, or ponds with pesticides. Avoid contaminating pasture, feed, and forage crops by drift of pesticide sprays and dusts.**

Bacterial head blight of western wheatgrass has been reported and leaf and stem rust, leaf spot, ergot, and smut are not uncommon on many grasses. Removing crop aftermath usually helps to reduce the occurrence.

## Residue Management

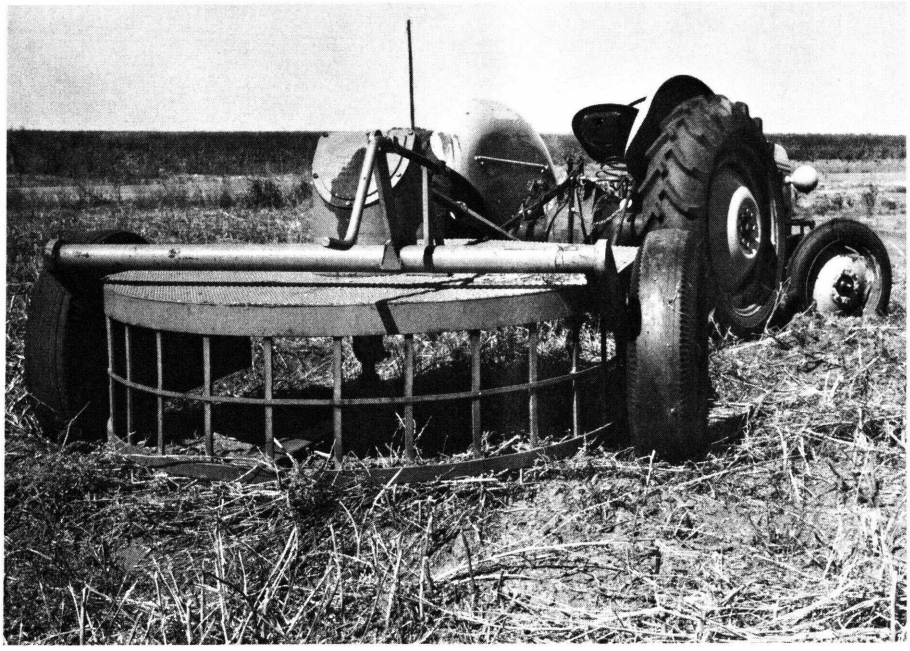
Grasses properly managed for seed production also produce a high yield of forage. Tall grasses commonly produce 5 tons or more of dry matter per acre. To stimulate new seed-head production and seed development, remove this crop aftermath (residue). With cool-season grasses, do this soon after the seed crop is taken. With warm-season grasses, remove before growth starts in the spring. If managed for two or more seed crops, the residue must be removed after the first seed crop.

It can be removed or used in several ways. Use the method that fits best into your farm enterprise and still gives you good seed yields.

Cool-season grasses that mature seed by midsummer are sometimes grazed for several weeks after seed harvest, but this method of management is apt to reduce the yield of the following seed crop. Unless you have a critical need for grazing, it is best to use some other method of crop aftermath removal.

Another method is to mow the aftermath immediately after harvest and use it for feed, bedding, or mulch. Forage quality at the time of mowing will determine the use.

The method that works best for warm-season grasses is to burn the residue just before growth starts in the



TEX-47, 337

**A shredder or rotary mower used after seed harvest to dispose of grass residue.**

spring. This puts the field in good shape for weed-control herbicides to get into the soil.

Still another method is to shred the aftermath to a stubble height of 4 to 6 inches and incorporate the material into the soil by cultivating. If you continue this year after year, incorporation and decomposition of the residue becomes a problem. Adding 25 pounds of nitrogen for each ton of dry matter helps to speed up decomposition. Still better, alternate the shredding method with periodic burning of the aftermath. This way you can control the amount of material you incorporate into the soil.

## *Harvesting Grass Seed*

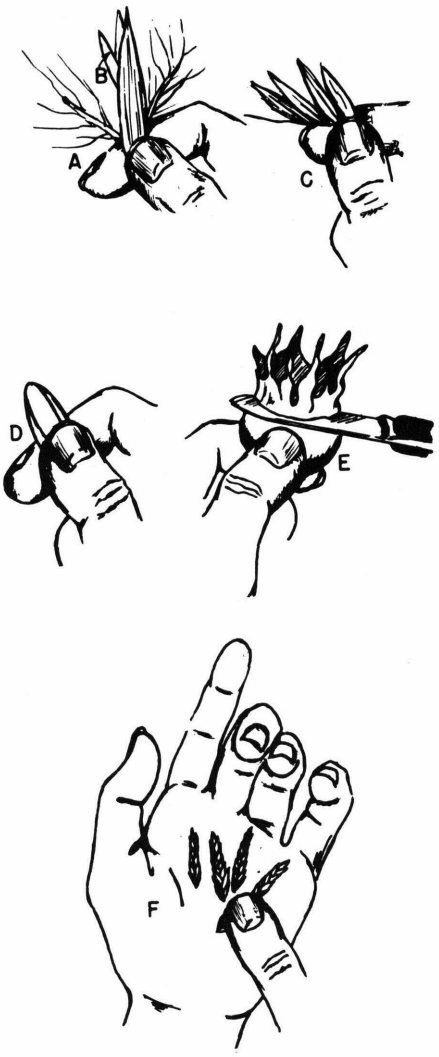
### When To Harvest

In simple terms, the right day to harvest is the one when the largest amount of seed is ripe. But it is not possible to harvest a seed field of more than a few acres in 1 day. This makes it necessary to start harvesting before all seed is mature.

Stages in development of grass seed are the same as for any other grain. They are milk, soft dough, hard dough, and vitreous or mature. Seed harvested in the milk and soft-dough stages may shrivel as it cures and fail to germinate when planted. Seed harvested in the hard-dough stage will cure out to become mature.

Heading and flowering of many range and pasture grasses take place over a long period. This means that at harvesttime some heads will be full of ripe seed, early heads nearly empty because of shattering, and late heads only starting to flower. You must make careful daily inspections during the flowering period to decide when most of the heads contain seed in the hard-dough and mature stages.

Keep in mind that flowering starts at the top of the heads and moves downward. Some shattering in early heads always occurs before harvest. For a few




Some field methods of determining grass-seed fill: *A, B,* pinching base of a fertile, sessile spikelet of little bluestem (note grain protruding in *B*); *C,* pinching base of several spikelets in a single spike of sideoats grama; *D,* pressing across center of a fertile floret of switchgrass; *E,* cutting across center of a buffalograss bur with a knife; *F,* rubbing out spikelets of weeping lovegrass in palm of hand. All seed units and spikelets are enlarged.

days the rate of daily shattering is matched by the amount of seed ripening. When this stage is past, the rate of shattering exceeds the rate of new seed ripening. In general, the interval between bloom and seed maturity is about 4 weeks. Cool moist weather may lengthen the interval while hot dry weather tends to shorten it.

Method of harvest may also determine the harvest date. When you use a binder or windrower, you can begin harvesting at an earlier stage of maturity than when you harvest directly with a combine.

## Harvest Machinery

Seed of nearly all the grasses discussed here can be harvested with ordinary farm machinery such as the combine, binder, and windrower (table 2). Most of the machines will need only a few minor adjustments.

The conventional stripper was once common for seed stripping on natural grasslands. Adaptations of this machine still are used for stripping bluegrass seed.

TEX-46, 617A

Grass-seed stripper with spiked drum that strips seed from head and carries it into seedbox.

*Table 2.—Harvest methods and seed yields*

| Grass | Method of harvest [1] | | | Yield of clean seed per acre with irrigation [2] |
|---|---|---|---|---|
| | Combine | Binder | Windrower | |
| Cool-season grasses: | | | | Pounds |
| Canada wildrye | # | X | | 600–1,000 |
| green needlegrass | X | # | X | 200–400 |
| slender wheatgrass | # | X | | 300–600 |
| western wheatgrass | # | | X | 200–300 |
| crested wheatgrass | # | | X | 200–400 |
| intermediate wheatgrass | # | X | | 300–500 |
| tall wheatgrass | # | X | | 300–500 |
| Russian wildrye | # | X | | 200–400 |
| tall fescue | # | | X | 300–500 |
| smooth brome | # | | X | 300–500 |
| creeping foxtail | X | # | X | 150–300 |
| Warm-season grasses: | | | | |
| big bluestem | # | X | | 300–400 |
| indiangrass | # | X | | 400–600 |
| sand bluestem | # | X | | 300–400 |
| switchgrass | # | X | | 300–400 |
| little bluestem | # | | | 200–300 |
| sideoats grama | # | | X | 400–500 |
| sand lovegrass | # | | | 400–500 |
| blue grama | # | | X | 150–250 |
| buffalograss | [3] | | | 300–600 |
| green sprangletop | # | | | 300–500 |
| plains bristlegrass | # | | X | 300–500 |
| Caucasian bluestem | # | | X | 150–200 |
| Turkestan bluestem | # | | X | 150–200 |
| weeping lovegrass | # | | | 400–500 |
| kleingrass | # | | | 150–200 |

[1] # Preferred method. X Alternate method.

[2] Seed production without irrigation is not dependable in most of the Great Plains. On fertile soil with 25 inches or more of annual precipitation, an average yield of no more than one-third to one-half that shown for irrigated production should be expected.

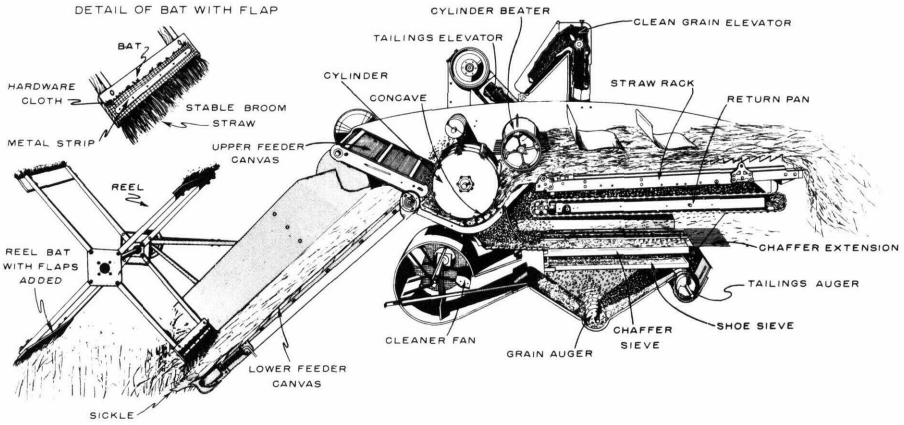
[3] Must be harvested with flail-type forage harvester or other special machine.

COMBINE.—With a few simple adjustments of a common grain combine, seed of all the grasses discussed here, except buffalograss, can be readily harvested.

Close down or completely shut off the air blast from the fan to the cleaning shoe. If closing the dampers and covering the openings in the fan housing do not reduce the air blast enough, remove the fan blades or bypass the fan drive. A light air blast helps when threshing wheatgrasses, switchgrass, and some other grasses but the air must be completely cut off when threshing most grasses or good seed will be blown out of the machine.

Remove all sieves and chaffers from the cleaning shoe except the adjustable upper chaffer. Open the vanes of this chaffer just wide enough to let threshed seed drop through while most of the straw rides on out of the machine.

On combines with wooden reel bats, attach belting flaps to the bats to sweep the sickle clean as the reel turns. Seed material that is short or light in weight may accumulate on and just behind the sickle until moved by the combine reel. The belting flaps reduce seed loss by

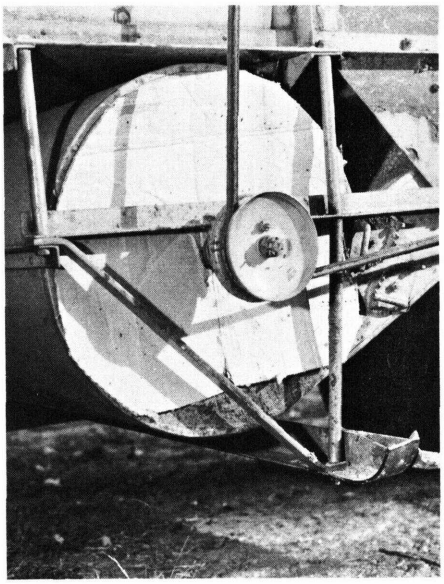



4-L-5202

**Cutaway view showing the units of a small-grain combine that are important in making adjustments for harvesting grass seed.**

keeping much seed from falling through the sickle. The Hume-type reel is designed to do the same thing.

If the cleaning shoe has an adjustable tailer, keep the louvers closed. If it has a tailings rake, cover it with tin or cardboard. This prevents material from falling down to the cylinder return auger. When the cylinder speed and cylinder concave spacings are right, returning the material simply adds more trash to the seed in the bin.



NEB-1827

**Air draft must be carefully controlled in combining grass seed. If machine adjustments do not give adequate control, it may be necessary to cover the air-intake openings of the fan.**

Both the cylinder-concave spacing and cylinder speed must be varied with the kind of machine and seed you have. Combine cylinders of small diameter must be driven at a relatively high speed to get the same degree of threshing you get with large-cylinder combines turning at a slower speed. For small all-crop combines a cylinder speed of 900 to 1,000 r.p.m. and a cylinder-concave spacing of $\frac{1}{2}$ inch is about right for threshing chaffy grass seed. For the same degree of threshing with a large self-propelled machine and the same cylinder-concave spacing, you must reduce the cylinder speed to 700 or 800 r.p.m.

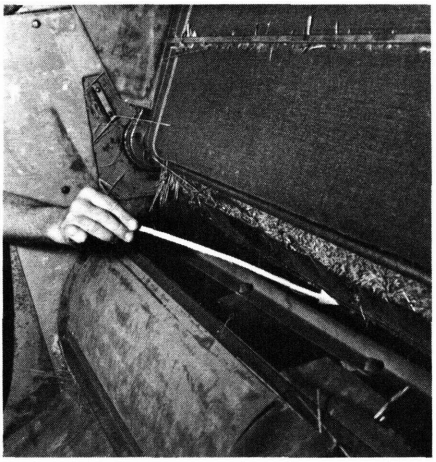
For chaffy grass seed such as that of the bluestems, use the widest cylinder-concave spacing coupled with the slowest cylinder speed that will dislodge all or nearly all ripe seed. This reduces to a minimum leaf and stem pieces going through the machine and into the bin with the seed. Chaffy grass seed is slow and costly to clean in a fanning mill so make every effort at this step to

keep the seed as free of trash as possible.

Grass seed that threshes free of a chaffy covering, such as switchgrass and lovegrass seed, is easy to clean to high quality in a fanning mill. For these, the amount of trash that goes with the seed into the bin is not important. The important thing is to get all the good seed into the combine bin.

Maintain a combine travel rate in the field that moves an even flow of cut material to the cylinder and over the chaffer in the cleaning shoe. If you overload the chaffer, seed rides out of the machine with the tailings. If you underload it, more trash has time to work down through the chaffer into the clean grain auger. Check the flow of threshed material from the separator frequently during each day of harvest to make sure a full threshing job is being done and that few good seed are being lost in the tailings.

BINDER.—A standard platform binder can be used in harvesting some grasses.



NEB-1829

**Close adjustment between cylinder and concave bars is needed in combining seed of some grasses.**

It works best for grasses 30 inches or more tall that do not hold the seed well at maturity. It cuts and ties the material into bundles that are usually shocked in the field and threshed

NEB-1831

**Checking the tailings from combine to see that the machine is properly set.**

OKLA-11, 894

Combine harvesting a mixture of little bluestem, indiangrass, and switchgrass seed on native grassland.

TEX-49, 743

Combine harvesting sideoats grama seed from an irrigated field.

MONT-305

Harvesting grass seed with a grain binder.

OKLA-11, 895

Combine threshing of switchgrass that had been cut with a binder and shocked for drying.

later. Binding can begin when the seed starts to pass from soft-dough to hard-dough stage. This way seed can be stored without drying after the bundles are threshed. In some years harvest by binder results in a higher seed yield than by direct combining because cutting begins earlier.

The disadvantage of binder harvest is the increased labor cost of shocking and handling the crop. If you use a binder, install two shallow trays to catch seed that shatters as the material is cut and tied. Attach one beneath the juncture of the bed and elevating canvases and the other between the tying mechanism and the bundle carrier. Mount both to slide readily in and out for easy dumping when full of shattered seed. Without these pans in place, seed yields may be much lower from binding than from combining.

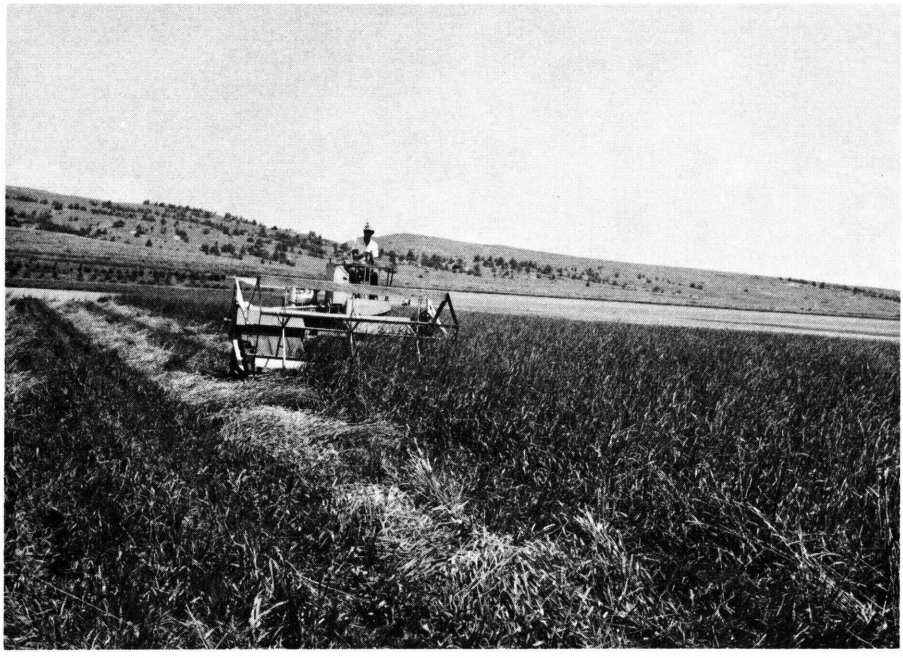
WINDROWER.—A windrower may be used to cut and windrow grass for curing in the field. The windrow is picked up and threshed later by a combine equipped with a pickup attachment. Windrowing has the same advantages as binding but is considerably more hazardous. The windrow may be scattered by a strong wind before the material is dry enough to thresh or rains may cause the seed to sprout or rot before the material can be threshed.

## Seed Drying and Cleaning

If seed is harvested directly with a combine, it must be dried before it can be stored safely in bags or bins. Several drying methods can be used. You can spread the combine-run seed material on a building floor or on tarps in the open. You may have to stir periodically while it is drying. During long dry periods, you can loosely bag some kinds of seed and leave the bags in the field to dry. Or you may unload the combine directly into wagons built so that an air draft can be moved through the seed. You

OKLA-11, 893

**Switchgrass that has been windrowed is picked up and threshed with a combine.**



MONT-10, 154

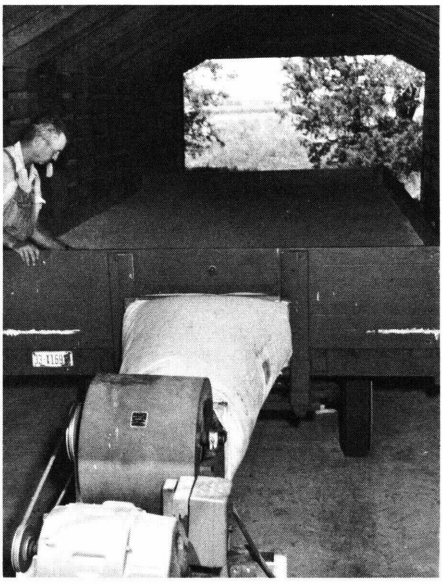
**Grass cut with a self-propelled windrower left to cure and dry in the field.**

can also dry seed in bins or in bags with heated air. Regardless of how you do it, you can reduce the drying time for freshly harvested material by first running it over a scalper to remove stems and leaves.

Most grass seed material must be recleaned before it can be marketed or planted. You must either be equipped to do this on the farm or arrange with a seed company for cleaning. Seed of some grasses is cleaned only enough for planting or marketing. Others are cleaned to a high degree of purity. Seed cleaning is costly and the demand of the market largely determines the degree of cleaning and the cleaning process you use.

In cleaning seed, first take out most of the stems, leaves, and other rough material. You can do this with a fanning mill that has a top screen of the right size, or with a scalper.

SEED SCALPER.—The scalper is especially useful in rough cleaning of some grass seed. For some, this is the only



NEB-2125

**Unheated forced air drying freshly harvested grass seed in a specially constructed farm trailer.**

TEX-51, 058

**Combine-harvested seed spread on tarps to dry—a method used if artificial drying equipment is not available.**

cleaning needed. More commonly it is used to hasten drying of freshly harvested seed material or for readying seed for more precise cleaning by other machines.

It is made up of a frame which supports an inclined screen that is shuttled back and forth by a motor-driven eccentric drive. Seed material is fed onto the upper end of the screen. Seed falls through the screen to the floor and stems and other trash ride off the lower end.

Seed scalpers are available commercially but satisfactory machines can be shop made.

TEX-49, 542

**A heated-air drying room with loosely filled bags of seed stacked over floor openings—an air draft heated to 105° F. is circulated through the seed.**

FANNING MILL.—A fanning mill is commonly used for cleaning grass seed. There is a model and size to fit most every need. A small, two-screen model does an acceptable job for small lots of seed and for grass seed that is not difficult to clean. In a fanning mill, the top screen acts as a scalper and the lower one sorts out the desired seed size. Select a top screen with openings just large enough to let seed drop through and still carry the straw off at the lower end. Choose a lower screen with openings small enough to retain all seed units of the size you want to keep, yet large enough to let dirt and other small impurities fall through to be channeled out of the machine. Seed that rides over the lower screen falls into a fan-air blast that removes dust and chaff lighter than the good seed.

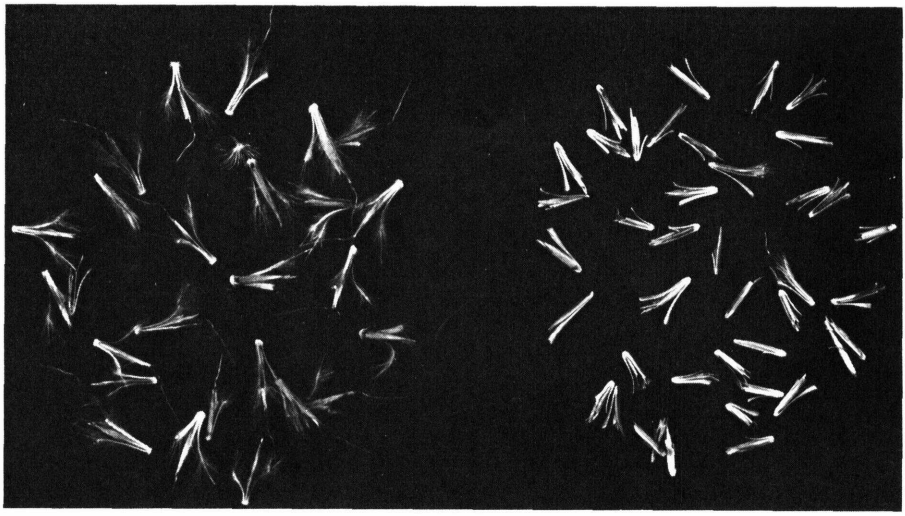
Some large fanning mills have three or four screens, larger screening areas, and more precise air controls. They clean seed more rapidly and make separations that cannot be made with the small machines.

## Seed Processing

Some kinds of grass seed must be run through a hammer mill or debearder before they can be cleaned to a high standard of purity or for planting with some kinds of equipment. This process removes awns, breaks up straw and other inert material, and removes outer glumes. Where grass drills or other equipment designed for planting non-processed seed are available, there is no need to process seed to this extent. In the southern Great Plains, these special grass drills are commonly available but in other parts of the area this is not true.

OKLA-11, 896

**A shop-made scalper for removing stems, leaves, and rough material from combine-harvested grass seed.**



R-7-766

**Seed of little bluestem before processing (left) and after removing appendages with a hammer mill or debearder (right)—a step necessary in cleaning some kinds of grass seed to a high degree of purity.**

When it is necessary to process grass seed, remember the hammer mill was designed for grinding. *Do not attempt to use it* unless it is altered so that the cylinder speed can be controlled. A proper and safe cylinder shaft speed for a hammer mill with a 10-inch cylinder diameter is 600 to 1,400 r.p.m. For a machine with a cylinder diameter larger than 10 inches, the shaft speed must be reduced. Following is a guide for using the hammer mill:

Use a screen with openings slightly larger than the seed unit to be rubbed through it.

Start the mill at slow speed. Keep the cylinder filled with seed material.

After a short trial run, examine the material that is coming through the screen. If you find few or no cracked or damaged seeds, and many about the same as when they entered the mill, advance the cylinder speed about 100 r.p.m.

Repeat the trial runs until you get the most trimmed material with the least seed breakage, then finish the processing job at that setting.

You will lose some seed in this process, but the loss will be small if you follow these guides. Make certain by thorough examination that only a small amount of seed is being damaged or the entire lot may be ruined.

A bag of grass seed on the commercial market must bear a tag that shows the kind of seed, where grown, and a current seed-laboratory analysis. If the analysis shows noxious weed seed (defined by law), the tag must show the kind and number per pound of material. This information will help the buyer avoid introducing weeds on his land.

In the Great Plains most seedsmen buy and sell seed on a pure live seed basis. Price is adjusted according to seed quality. Pure live seed (PLS) is determined by multiplying the germination figure by the purity figure and pointing off two places from the right.

The percent of purity indicates how much of the total bag weight is made up of mature (pure) seed units. The percent of germination shows the percentage of pure seed that sprouted during the seed laboratory test period—usually 4 weeks.

Pure live seed represents the seed units you can expect to grow when planted. To determine the real value of a lot of seed, you must relate the price to the pure live seed. For seed priced on a bulk seed basis, divide PLS into the seed price. For example, 70-percent germination X 30-percent purity divided into $1.05 is 5 cents per PLS unit. Another lot with a germination of 65 percent and purity of 46 percent priced at $1.20 costs the buyer 4 cents per PLS unit. Though the bulk price was higher, the PLS price is lower for the second lot. Pure live seed provides a sound basis for comparing seed price and for determining seeding rates.

### Seed Testing and Storage

While grass seed is being cleaned, take a small sample of clean seed from each bag and place in a separate bag. When cleaning is finished, thoroughly mix the samples. From this, draw a small sample and send it to a seed laboratory for testing. Keep the rest of the sample for use in retesting. This is the easiest way to get a sample that represents the lot of seed.

Freshly harvested seed may not germinate well until it has been stored for several months. Some germinate well almost immediately but others must first go through a period of after-ripening dormancy. To get a fair germination value for most grass seed, delay submitting the sample for testing or resubmit later for retesting.

Stored under dry, cool conditions, most seed of Great Plains grasses retain their viability for several years. Under humid conditions and high temperatures seed rapidly loses viability.

## *Marketing Grass Seed*

Some farmers who grow grass seed in the Great Plains market all of their production through a major seed company. To do this they enter into a production and marketing agreement with the wholesale seed company. The seed company and the grower agree on the

TEX-51, 060

**This aging stand of Blackwell switchgrass grown for seed provides pasture, if needed, as an alternative use. The livestock can be removed early enough to produce a seed crop.**

kind and approximate amount of seed to be produced and on the price to be paid the grower. After the seed material is grown, harvested, and dried by the grower, he delivers it in bulk to the seed company warehouse for cleaning and sale.

This relieves the grower of the need to:

- Acquire seed-cleaning equipment and learn how to use it.
- Provide storage for the seed after it is cleaned and bagged.
- Obtain seed laboratory analyses and tag his product.
- Act as the seller to the using public. Few farmers have had experience in retail selling of other crops they grow and lack a direct contact with the people who need and buy grass seed.

Except that no prior agreement is involved, this is about the way a farmer markets his other grain crops. In lieu of this kind of arrangement, the seed grower must seek a market for his seed from year to year either directly to the user or to a seed company.

## *Where To Get Help*

When you begin producing grass seed, you may need experienced assistance. Technical on-the-farm assistance of the Soil Conservation Service is made available to district cooperators in conservation districts. Also, special planting equipment is available to cooperators in many districts.

Agricultural experiment stations and SCS plant-materials centers select and develop grass varieties that are locally adapted and that will meet specific needs in conservation, recreation development, and beautification. Varieties developed are tested in the field and cultural methods for seed production are worked out. Seed of tested selections proved to have value is increased by the experiment station or the plant-materials center and distributed to seed growers through crop-improvement associations and soil conservation districts. By this means many grasses and grass varieties have been brought into commercial production and use to meet specific needs in the Great Plains.

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